

**CHESS TOURNAMENT MANAGEMENT SYSTEM
(PAIRING MODULE)**

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ABSTRACT

Chess is one of the student's favourite sports in KUKTEM. All Chess tournaments in KUKTEM are organized by chess club. Unfortunately, tournaments cannot run smoothly due to problems that occurred during the tournaments' management process. Lateness of pairing and unfair colour allocation was among the problems that should be overcome by Chess Club generally. Involvement of too many players in a particular tournament causes lateness. The organizer has to waste a lot of time in chess pairing. Besides that, problems of unfair colour allocation lead to argument among players. All players prefer white colour rather than black colour because they got better chance to win if they are white side. Furthermore, mistake always occurred when tournament comes to heavy task like chess pairing and colour allocation. This causes players complaint about the unfair treatments in the tournament. So for that, in order to overcome the problem, Chess Pairing module needs to be developed. The development of chess pairing module of Chess Tournament Management System is suggested for handling the player pairing and colour allocation in every match. A Software Development Life Cycle (SDLC) is used as a method in the development of this system. Chess Pairing module will use Gale Shapley method as a based idea to develop an algorithm to do the entire pairing and colour allocation task.

ABSTRAK

Catur merupakan salah satu sukan kegemaran pelajar KUKTEM. Semua pertandingan catur di KUKTEM adalah dianjurkan oleh kelab catur. Namun demikian, masih terdapat masalah dalam pengendalian pertandingan sehingga pertandingan tidak dapat berjalan dengan lancar. Masalah seperti penentuan pasangan perlawanan yang lembap dan pemberian warna yang tidak adil merupakan masalah yang perlu diatasi oleh kelab catur. Kelewatan selalu berlaku apabila bilangan pemain dalam pertandingan terlalu ramai. Banyak masa diambil oleh penganjur untuk melakukan kerja penentuan pasangan perlawanan untuk semua perlawanan. Dalam masa yang sama, pemberian warna yang tidak adil juga sentiasa berlaku kerana pemberian warna sukar ditentukan dan selalu menimbulkan isu ketidakpuasan di kalangan pemain. Semua pemain lebih gemar main catur dengan warna putih daripada warna hitam kerana peluang untuk menang adalah lebih tinggi. Selain itu, kesilapan juga selalu berlaku dalam kerja-kerja berat seperti penentuan pasangan perlawanan dan pemberian warna catur. Ini menyebabkan ramai pemain mengadu tentang ketidakadilan dalam pertandingan. Maka dengan itu dicadangkan agar modul penentuan pasangan perlawanan diwujudkan bagi menyelesaikan masalah tersebut. Pembangunan system ini adalah untuk menyenangkan kerja penentuan pasangan dan warna dalam setiap perlawanan. System ini dilaksanakan dengan menggunakan kaedah *Software Development Life Cycle (SDLC)*. Dalam module ini, kaedah Gale Shapley akan digunakan untuk membangunkan algorithm yang dapat melakukan kerja penentuan pasangan dan warna.

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LIST OF ABBREVIATIONS

CTMS	-	Chess Tournament Management System
KUKTEM	-	Kolej Universiti Kejuruteraan dan Teknologi Malaysia
SQL	-	Structured Query Language
IT	-	Information Technology
SDLC	-	Software Development Life Cycle
SMP	-	Symmetric Processing

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CHAPTER 1

INTRODUCTION

Chess tournament management is heavy task that needed to perform in whatever chess tournament in order to perform fair treatments for all players. Organizer need to do the pairing as well as the scoring task for the chess tournament that took a lot of time. The pairing task can be defined as a task that determined which player is supposed to meet which player in the tournament. Colour allocation of chess tournament is also a crucial part in pairing task that determines whether player play in black or white side of chess board.

In fact of that, Chess Tournament Management System (CTMS) is stand –alone system that reduces the time spent on administrative tasks by simplifying all phases of chess tournament management. This system will take KUKTEM as case study. Basically, this system is designed to be divided into 3 modules which are:

- a) Pairing Module
- b) Scoring Module
- c) Scheduling Module

Pairing module of Chess Tournament Management system is a module that designed to help handle the pairing task for all chess tournaments and provide a fair treatment for players.

1.1 Problem statement

In many chess tournament, the number of players is much larger than number of rounds to be played. In such tournament, a lot of time needed to complete the whole pairing process. There are a lot of arguments and complaints in those chess tournaments. Players feel like not treated fairly if international rules of chess tournaments weren't followed by the tournament especially in the first round pairing method. Besides that, when tournament comes to heavy and confusing task like take back round, pairing or colour allocation, mistakes always made by organizer.

1.2 Objectives

The objectives of this project are:

- a) Develop an algorithm that can be used to determine the pairs in pairing system.
- b) Allocate suitable colour for each player in every chess board by providing computerized colour allocation algorithm.

1.3 Scopes

The scopes of this project are:

- a) Develop a module that consist new algorithm to generate pairing task for both knock out system and Swiss system.
- b) Using Visual Basic.net as programming language and SQL server as the database.
- c) Data limitation is within 50 players in a tournament.

CHAPTER 2

LITERATURE REVIEW

2.1 Chess Pairing System

If in a chess tournament the number of players is a lot bigger than the number of rounds to be played, two systems of chess pairing will be used in the chess tournament. They are Swiss Pairing [1] and Knock out Pairing [1].

2.1.1 Swiss Pairing system

For Swiss Pairing system, players are numbered from 1 to n according to their ratings so that the player with the highest rating gets number 1 and the player with the lowest rating gets number n . In the first round the pairs are $(1, n/2)$, $(2, n/2 + 1)$, ..., $(n/2 - 1, n)$. The winner of a game scores one point, the loser scores nil.

In the second round and in all rounds to come players with equal scores should play against each others. This is not always possible. An obvious reason is that there can be score groups (i. e. groups of players with equal number of points) with odd number of players. Second, the players in a score group may have already played against each others.

Third, in addition to scores we must also take care of the colours (playing with white or black pieces). As far as possible, at the end of each even round, all players should have had an equal number of whites and blacks. The colour history tells the colours with which the player has played in the previous rounds. An alternating colour history (e.g. WBWBW) is the optimal one. There is a trade-off between the demands concerning scores and colours: is it better to allow a pair with non-equal scores if it equalizes the colour histories or should we stick with equal scores although it might mean repetition of colours.

Pairing must be done score group by score group starting at the topmost group and continuing just above the middle group (the one containing the median player), then going to the lowest group and continuing upwards. Finally we handle the middle group with all the problematic cases pushed forward when the other groups were handled.

2.1.2 Knock Out Pairing System

This system is used to rapidly find the best player in a large pool of participants. This is achieved by eliminating losers of each match from the tournament. Just like Swiss System tournaments, the top player in the upper half of the field is then paired against the top player in the lower half of the field, and so on. The top-ranked player get white colour in the first round, and then colours alternate down the halves. Player who win in the match will qualified to next round and paired with next player who win his match. This flow will be continued until the winner born.

2.2 Traditional Chess Tournament Management

Currently in KUKTEM, All chess tournaments were organized by chess club. To organize a fair and no argument chess tournament, the organizer has to be a very

knowledgeable person that expert in all chess rules and tournament rules. He needs to take care of all pairing task and scoring task as well as judging task in that particular tournament so that no argument will be occurred in that tournament. Before the tournament start, organizer has to set how many round will be played. All the participants' name must first be collected. Then organizer and his members will do the pairing for first round. All players will get their board or seat. Each board will have 2 players. Each player's colour (Black or White) will be allocated by organizer and his members. Players will start play on allocated colour and then the first round complete. All result will be collected and the score will be calculated. A standing table needs to be generated to make sure all participants clear with their situation. This took time about 30-45 minutes for the organizer to produce the standing. Based on the score, pairing for next round will be generated. In chess, there are always an occasion where 2 or 3 players have same scores, thus there are a lot of international rules that used to do the pairing. After all round finished, player with the highest rank in standing table will win the tournament.

2.3 Computerized Chess Pairing System

Basically, there are very few approaches that can be implemented to do the computerized Chess Pairing. Approach that used in this module is an approach that based on algorithm named Gale Shapley. This Algorithm was developed by Gale Shapley at 16, February 1975

2.3.1 Gale Shapley Algorithm

The Gale-Shapley algorithm [2] finds a stable matching in time $O(n^2)$, where n is the common number of men and women. For each instance there exists at least one

stable matching and the maximum number of stable matching grows exponentially when n grows.

Based on Gale- Shapley algorithm that showed in figure 2.1, in the first round each man proposes to the woman whom he most prefers, even if someone else has already proposed to her. Then, from the proposals that she receives, each woman tentatively accepts the proposal from (becomes engaged to) the proposer whom she prefers the most; she rejects all the other proposals. A woman who does not receive any proposals waits for the next round.

In each subsequent round man who are currently engaged do nothing. Each man who is not engaged makes a new proposal, to the woman highest in his preference ranking who has not already rejected him, whether or not she is already engaged. In the women's part of the round, a woman accepts the proposal from the man highest in her ranking, rejecting all others and (if necessary) breaking her current engagement to become engaged to a man higher in her ranking. A woman who does not receive any proposals in this round waits for the next round.

If an arbitrary man prefers another woman to the one to whom he is matched, then he must have proposed to that other woman in some round. She must have rejected him because she preferred someone else. Hence, the man and woman in question cannot be a blocking pair. But since the man was arbitrary, and the woman was any woman whom he preferred over the one to whom he was matched, this have shown that there are no blocking pairs in the matching.

No man's proposal is affected in any way by what another man does. Likewise, no woman's choice is affected by what other women do. So, in each round it doesn't matter in what order the proposals are made or in what order the women make their choices.

When the algorithm terminates, all the men are engaged. Since each man is engaged to exactly one woman, and there are exactly as many women as men, we have a matching.


```

for each unengaged man
    send proposal to highest-ranked woman not yet proposed to
endfor
for each woman
    get engaged to most preferred man who has proposed
endfor
while there is man who is not engaged
    for each man, m
        if m is not yet engaged then m springs into action
            w highest on m's list to whom m has not yet proposed
            add w to m's list of women proposed to m proposes to w
        endfor
    for each woman w engaged or not
        if no proposers then do nothing
        else
            m highest among proposers to w identify best suitor
            if w is not engaged then engage to best suitor
                engaged(m) true
                engaged(w) true
                add (m,w) to list of engaged pairs
            else w is already engaged
                if w prefers m to current proposer then
                    w dumps m' and engages to m
                    engaged(m') false
                    delete (m', w) from list of engaged pairs
                    engaged(m) true
                    add (m, w) to list of engaged pairs
                else w rejects m, so m remains unengaged
            endif
        endif
    endif
endfor

```

Figure 2.1: The Gale Shapley Algorithm

2.4 Programming Tools

In order to develop CTMS, Microsoft Visual Basic.Net is selected as programming language and Microsoft Structured Query Language (SQL) Server 2000 for database programming.

2.4.1 Microsoft Visual Basic.Net

Visual Basic.Net was chosen for system interface programming. This is because Visual Basic.Net has a lot of advantages in term of object-oriented specification. Nearly all world-class software, from the leading Web Browsers to mission-critical corporate applications, is built using the Microsoft Visual Basic.Net development system. Visual Basic.Net is among the most productive tool for the highest-performance development for Windows.

2.4.2 Microsoft SQL Server 2000

Microsoft SQL Server 2000 was chosen as the database for this system. Microsoft SQL Server 2000 is the complete database and analysis that offers for rapidly delivering the next generation of scalable e-commerce, line-of-business and data warehousing solutions. Below are among the benefits of SQL Server 2000:

- a) Fully windows application-Enabled – It can make query, analyze and manipulate data over the windows.
 - b) Highly Scalable and Reliable – It can grow without limits with enhanced scalability and reliability features. Partition database workload to achieve scale-out of applications. Take full advantage of Symmetric Multiprocessing (SMP) hardware.
 - c) Fastest Time-to-Market –Reduce development time with the integrated T-SQL debugger, and develop functions that can be reused in different applications.
- SQL Server 2000 provides the fastest route to windows application development.

CHAPTER 3

METHODOLOGY

3.1 System Overview

This project development is implemented based on a methodology and standard modelling technique in order to enable the communication becomes easier to understand, the system can be controlled and maintenance work can be done easier.

For that, this project is carrying out by using the Software Development Life Cycle (SDLC) method. It provides a consistent framework of tasks and deliverables needed to develop systems. The SDLC methodology is chosen as it includes only those activities that appropriate for this project. This is the most popular development model in the contemporary IT industry and most of the software products or systems have been developed successfully by using this model.

The SDLC is based upon two principles: dividing projects into phases, and using written documentation. While the exact phases in the cycle vary from one author or organization to the next, they generally follow along these lines, as shown in Figure 3.1: identify the system requirement, project initiation and planning, analysis, design, development implementation and testing. Each phase within the overall cycle may be made up of several steps.

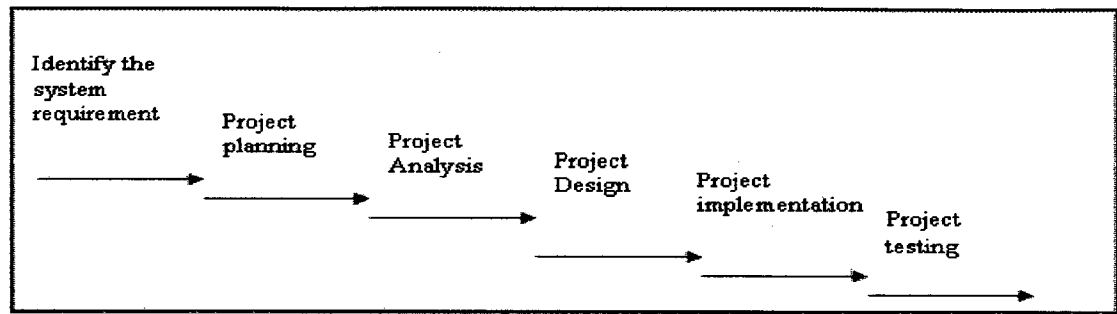


Figure 3.1: SDLC model

3.2 Identify the system requirements

The first phase of the development in which all the data and information required is identified, collected and analyzed. The purpose of this phase is to determine the needs and define the problems that need to solve. Thus, during the process, the possible information's that could undertake include:

- a) Identifying the system of play and rules that used in chess tournaments in KUKTEM chess club.
- b) Identifying the reason system of play used in chess tournament.
- c) Identifying the limitation of each system of play.
- d) Consideration on what type of system architecture will be used and what type of pairing algorithm applied in all chess tournament system

3.3 Project Initiation and Planning

In this phase, a high level view of the intended projects need to be establish and the goals is determined. It is a critical activity in the life cycle of project in which at this point, projects would be accepted for development, rejected infeasible, or redirected. The system initiation and planning process are explained in below section.

3.3.1 Initiation

- a) This module is to do the entire pairing task for every round in chess tournament as well as allocate colours for players.
- b) 50 students only are allowed to register as player to prevent the program from responding slow.

3.3.2 Planning

- a) The Gantt chart (appendix A) shows the duration of each activity that being done during the project. The planning stage starts from propose the project title and defining the scope. Then, continue with the out come of the literature review and methodology in which is analysis process is the major activity.
- b) Each module's task divided, system and module architecture diagram was designed to provide clearer view of the overall system.

3.4 Analysis

During analysis phase, the overall system and module architecture is studied and alternative replacement systems are proposed. There are three main activities in analysis phase: requirement determination, requirement structuring and alternative generation and selection process. Requirement determination is the only use in the development of this system.

Requirement determination is process of finding resources either primary or secondary resources. All data that required is collected from member in KUKTEM's chess club about the rules and limitation in chess tournament. Besides, pairing algorithm

and colour allocation method also collected from the books, internet and thesis documentation is analyzed to meet the requirement of the system.

3.5 Design

The physical characteristics of the system are designed during this phase. All interfaces are established and their function was defined. A design strategy is a combination of system features, hardware and acquisition method that characterize the nature of the system and how it will developed. Basically, the module design can be divided in to three which are:

- a) Tournament Player Profile Management
- b) Pairing Task for the entire tournament
- c) Colour Allocation for every board in each round.

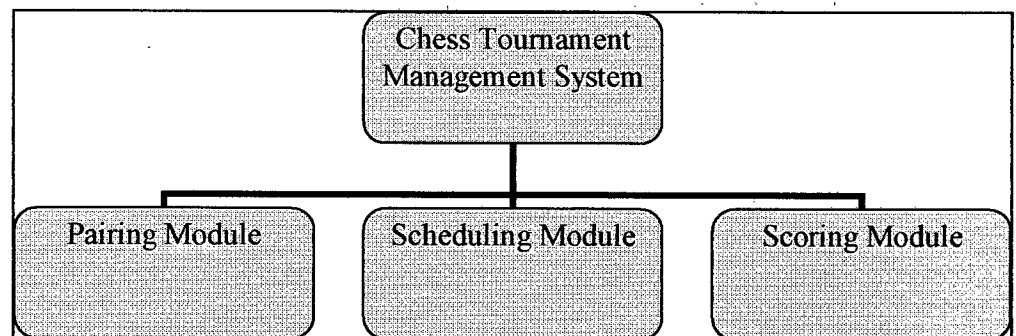


Figure 3.2: System Architecture Diagram

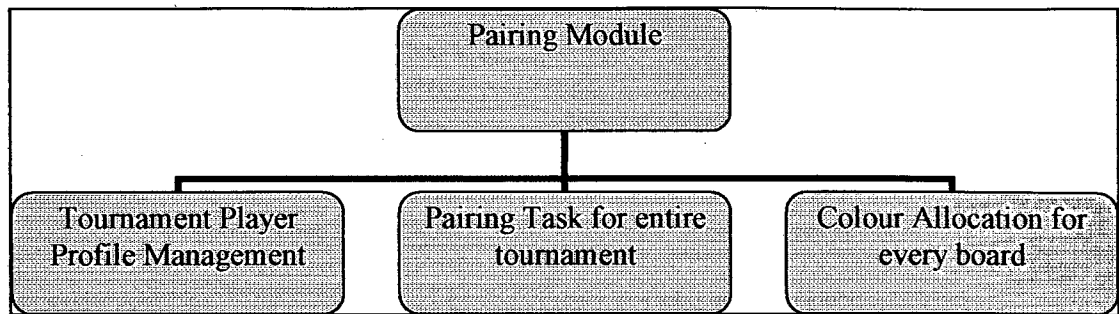


Figure 3.3: Module Architecture Diagram

3.5.1 Tournament Player Profile Management

This is a module that allows the system to do the registration part for all students that interested to join a tournament. Before they join a tournament, they first need to register as club member and tournament organizer will then key in their name and identification number. After that, organizer will drag their name to player's name if anyone of them wants to join the tournament. All players' detail will be set into database. Once they join the tournament, they will automatically get a club rating. The club rating represent the ranking of the player. If they continuously win in match, their rating will keep increased.

3.5.2 Pairing Task for entire tournament

Generally pairing task can divided into two because this system are using two type system of play which are Swiss System pairing and Knock Out Pairing.

3.5.2.1 Swiss System Pairing Task

Swiss System Pairing is a special pairing system suitable for chess tournaments with a large number of participants without eliminating any players in the process. Normally, as 1 player continues to win games, he or she will face progressively stronger opposition, leaving those not so successful to play against each other. Toward the end of the event, player will probably find himself matched against players around your own level.

Based on figure 3.4, for the first round, the players are paired either randomly or club rating. For randomly pairing all player will paired based on randomize list. For pairing based on club rating, the top player in the upper half of the field is then paired against the top player in the lower half of the field, and so on. The top-ranked player get white colour in the first round, and then colours alternate down the halves.

In the second round, the organizer uses the same principles to pair each of the three score groups (those who won and those who lost). These pairing procedures will continue through the rest of the tournament. Player with highest score gets the champion.